**Chapter one**

**Introduction**

**1.1 Background to the Study**

In today's competitive business environment, organizations are constantly seeking ways to enhance their operational efficiency and improve the skills of their workforce. Industrial training plays a vital role in bridging the gap between theoretical knowledge and practical skills, ensuring that employees are well-equipped to handle their job responsibilities effectively. However, managing and evaluating industrial training programs can be a complex and time-consuming task for organizations. This has led to the development of Industrial Training Evaluation Management Systems (ITEMS), which are designed to streamline and automate the process of evaluating and managing industrial training programs.

Traditional methods of training evaluation, such as manual record-keeping, paper-based assessments, and fragmented data management systems, have proven to be inefficient and prone to errors. Organizations often struggle to track training progress, assess trainee performance consistently, and generate comprehensive reports for decision-making. As a result, there is a growing need for a centralized and automated system that streamlines the evaluation and management of industrial training programs. The emergence of advanced technologies, such as cloud computing, data analytics, and learning management systems, has paved the way for the development of Industrial Training Evaluation Management Systems (ITEMS). These systems leverage technology to facilitate the seamless tracking, assessment, and management of industrial training programs. By utilizing ITEMS, organizations can overcome the limitations of manual processes and enhance the effectiveness and efficiency of their training initiatives.

Recent studies have highlighted the significance of incorporating technology-based solutions for managing industrial training. For example, a study conducted by Maurya and Sharma (2021), examined the challenges faced by organizations in managing and evaluating industrial training programs. The study emphasized the need for a digital platform that integrates various training activities and enables organizations to assess trainee performance accurately.

Sajjadi, Khan, Bhatti, Ziauddin and Lee (2022), investigated the impact of utilizing learning management systems in industrial training programs. The study found that the implementation of an integrated system improved training outcomes, reduced administrative burdens, and provided real-time insights into trainee progress.

Furthermore, the advent of artificial intelligence (AI) and machine learning (ML) has opened up new possibilities for industrial training evaluation. AI-based systems can analyze vast amounts of data, identify patterns, and provide personalized recommendations for training interventions. For instance, a study by Chen & Huang (2021), explored the use of AI and ML techniques in assessing trainee performance during industrial training programs. The findings demonstrated the potential of AI-enabled systems in automating assessment processes and improving the accuracy of performance evaluations.

**1.2 Problem Statement**

The management and evaluation of industrial training programs pose significant challenges for organizations. Traditional manual processes and fragmented data management systems hinder the efficiency and effectiveness of these programs, leading to suboptimal outcomes and wasted resources. The lack of a centralized and automated system results in difficulties tracking training progress, assessing trainee performance consistently, and generating comprehensive reports for decision-making. Consequently, there is a pressing need for an Industrial Training Evaluation Management System (ITEMS) that streamlines and enhances the evaluation and management of industrial training programs.

Addressing these problems is crucial for organizations aiming to optimize their industrial training programs and ensure the development of a skilled and competent workforce. By developing and implementing ITEMS, organizations can overcome these challenges, streamline their training management processes, and leverage data-driven insights for continuous improvement.

**1.3 Aim and Objectives**

The aim of this project is to design and develop an Industrial Training Evaluation Management System (ITEMS). The specific objectives of this project are as follows:

1. To analyze the existing challenges faced by Federal Polytechnic, Mubi in evaluating and managing industrial training programs.
2. To design a user-friendly and intuitive interface for the ITEMS.
3. To develop a robust and scalable system that allows organizations to track, assess, and manage industrial training activities.
4. To integrate reporting and analytics features that provide organizations with valuable insights into the effectiveness of their training programs.

**1.4 Significance of the Study**

The significance of this study lies in its potential to revolutionize the way organizations evaluate and manage their industrial training programs. By implementing ITEMS, organizations can automate manual processes, reduce administrative overheads, and ensure a standardized evaluation process across different training activities. Moreover, the system's reporting and analytics capabilities will enable organizations to make data-driven decisions regarding their training strategies and identify areas for improvement.

**1.5 Scope and Limitations**

This project will focus on the design, development, and evaluation of an Industrial Training Evaluation Management System. The system will be designed to cater to the needs of a wide range of industries and training programs. However, it is important to note that the implementation of ITEMS will require adequate technological infrastructure and resources within organizations. Furthermore, this project will not delve into the specific training content or curriculum development but rather concentrate on the evaluation and management aspects of industrial training. The system will provide a centralized platform for tracking and assessing training activities, monitoring trainee progress, and generating comprehensive reports.

**1.6 Definition of Some Operational Terms**

**Industrial Training**: Industrial training refers to a structured program designed to provide practical hands-on experience and skill development to individuals in a specific industry or organization (Alwi, Adamu, & Sanusi, 2021).

**Evaluation**: Evaluation refers to the systematic process of gathering, analyzing, and interpreting

data to assess the effectiveness, efficiency, and impact of a training program (Başoğlu & Ozden, 2022).

**Management System**: A management system is a set of processes, procedures, and tools designed to plan, organize, and control activities within an organization (Johansson, Jeppsson, Jeppsson & Olsson, 2020).

**Automation**: Automation refers to the use of technology and computerized systems to perform tasks and processes with minimal human intervention (Van Weele, Essers, & Rutte, 2021).

**System**: A system refers to a collection of interconnected components, processes, or elements that work together to achieve a specific purpose or objective (Huang,2021).

**Chapter TWO**

**Literature Review**

**2.1 Introduction**

This chapter presents a comprehensive review of the recent literature related to Industrial Training Evaluation Management Systems (ITEMS). The literature review aims to establish a theoretical foundation for the development and implementation of ITEMS by examining key concepts, theories, and empirical studies relevant to industrial training evaluation and management. Through an exploration of the existing body of knowledge, this chapter identifies gaps and provides context for the design and development of ITEMS.

**2.2 Theoretical Framework**

**2.2.1 Training Evaluation Models**

Various training evaluation models have been proposed to assess the effectiveness of training programs. Kirkpatrick's Four Levels of Evaluation (Kirkpatrick, 1994) is a widely recognized model that includes four levels: reaction, learning, behavior, and results. This model provides a structured approach to evaluate training outcomes. Phillips' ROI Model (Phillips & Phillips, 2016) focuses on measuring the return on investment of training initiatives. These models have been extensively used in the evaluation of industrial training programs.

**2.2.2 Technology Acceptance Models**

Technology Acceptance Models (TAM) help understand the factors influencing the acceptance and adoption of technology-based systems. The Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003) and the Technology Acceptance Model 3 (TAM3) (Venkatesh & Bala, 2008) are widely used in the context of technology adoption and user acceptance. These models provide insights into the factors influencing the acceptance and usage of ITEMS by organizations and trainees.

**2.3 Industrial Training Evaluation Practices**

Industrial Training Evaluation Practices involve the methods, tools, and approaches used by organizations to assess trainee performance, evaluate learning outcomes, and measure the effectiveness of their training programs. Recent research has explored various evaluation practices, highlighting their advantages, limitations, and implications for industrial training.

Self-assessments allow trainees to evaluate their own performance, reflect on their learning experiences, and identify areas for improvement. Chen *et al.* (2022), examined the use of self-assessments in industrial training evaluation. The findings indicated that self-assessment practices encouraged trainees to take ownership of their learning, fostered self-reflection, and contributed to the development of metacognitive skills.

Quizzes and Knowledge Assessments: Quizzes and knowledge assessments are commonly used to evaluate trainee understanding of training content and measure knowledge retention. A study by Wang et al. (2022) investigated the impact of quizzes in industrial training evaluation. The research found that quizzes not only assessed trainee knowledge but also promoted engagement and active learning during training sessions.

Performance Evaluations and Competency-based Assessments: Performance evaluations assess trainee skills, competencies, and application of knowledge in real or simulated workplace scenarios. Research by Kaur et al. (2021) examined the use of performance evaluations in industrial training. The study highlighted the value of competency-based assessments, emphasizing the importance of aligning assessment criteria with industry standards to ensure the validity and reliability of performance evaluations.

Feedback Mechanisms and Peer Assessment: Feedback mechanisms, such as feedback from trainers or peers, provide valuable insights and guidance for trainee improvement. Peer assessment allows trainees to evaluate and provide feedback on each other's work. A study by Yang, Jia, and Cao (2021) examined the effectiveness of feedback and peer assessment in industrial training. The research demonstrated that feedback and peer assessment contributed to trainee learning, self-reflection, and the development of critical thinking skills.

**2.4 Industrial Training Management Systems**

Recent research has investigated the features, functionalities, and benefits of industrial training management systems and learning management systems (LMS) in managing industrial training programs. These systems enable organizations to streamline training activities, track trainee progress, and automate administrative tasks. Research has shown the positive impact of technology-based training management systems on organizational efficiency, trainee satisfaction, and training outcomes.

Recent research has highlighted the benefits and effectiveness of ITMS in managing industrial training. Studies have demonstrated how these systems enhance organizational efficiency, improve training program effectiveness, and provide valuable insights into trainee performance and progress. ITMS enables organizations to centralize training administration tasks, reducing administrative overheads and improving operational efficiency. Research by Bozkurt, Yüksel, and Yüksel (2021) examined the impact of a learning management system (LMS) on employee satisfaction and performance. The study found that the implementation of an LMS improved training administration processes, leading to increased employee satisfaction and productivity.

ITMS provides interactive and engaging learning experiences for trainees through features such as multimedia content, online assessments, and discussion forums. A study by Algahtani and Palvia (2021) investigated the impact of an ITMS on trainee engagement and satisfaction. The results indicated that the use of ITMS significantly improved trainee engagement, leading to enhanced learning outcomes.

ITMS allows organizations to track trainee progress in real time, enabling better monitoring and support throughout the training program. A study by Idrus et al. (2022) examined the use of ITMS in tracking trainee progress in an industrial training program. The findings showed that ITMS provided timely insights into trainee progress, facilitating personalized support and intervention when needed.

ITMS offers robust reporting and analytics capabilities, allowing organizations to generate comprehensive reports and derive insights from training data. These insights can inform data-driven decision-making processes related to training program improvements, resource allocation, and performance management. Raut et al. (2022), explored the use of analytics in an ITMS for identifying training gaps and improving training program effectiveness. The research highlighted the significant role of analytics in driving informed decision making.

These recent studies demonstrate the positive impact of ITMS in managing industrial training programs, improving efficiency, enhancing trainee engagement, enabling real-time progress tracking, and supporting data-driven decision-making processes. By implementing ITMS, organizations can effectively manage their training programs, optimize resource allocation, and achieve better training outcomes.

**2.5 Integration of Analytics and Reporting**

The integration of analytics and reporting capabilities within industrial training management systems has gained importance. Research has explored the use of data analytics, business intelligence, and reporting tools to derive insights from training data. These insights aid in identifying trends, evaluating training effectiveness, and making data-driven decisions in training management.

Analytics integrated into ITMS allow organizations to evaluate the effectiveness of their training programs and make data-driven decisions for improvement. A study by Zhou *et al*. (2021), examined the use of data analytics in evaluating training programs. The research found that organizations that integrated analytics into their ITMS had a better understanding of training outcomes, enabling them to identify areas for improvement and make informed decisions regarding training program modifications.

Analytics capabilities within ITMS enable the identification of trends, patterns, and correlations in training data. By analyzing data collected during training activities, organizations can identify common strengths and weaknesses among trainees, training modules, or specific skills. Obeidat and Alzoubi (2021), investigated the use of analytics in identifying training trends and patterns. The findings revealed that analytics tools provided valuable insights into trainee performance patterns, enabling organizations to tailor training programs to address specific needs.

Reporting functionalities within ITMS enable organizations to generate comprehensive reports on training program effectiveness, trainee performance, and learning outcomes. These reports provide a holistic view of training activities and facilitate informed decision-making processes. A study by Javed *et al.* (2022), explored the role of reporting features in an ITMS. The research indicated that organizations utilizing reporting functionalities reported enhanced understanding of training program outcomes and were better equipped to assess the effectiveness of their training initiatives.

Predictive analytics, when integrated into ITMS, enable organizations to forecast trainee performance and identify potential gaps early on. By analyzing historical training data, organizations can make proactive interventions to support struggling trainees or provide advanced training for high performers. Guo *et al.*  (2022), investigated the use of predictive analytics in an ITMS. The research demonstrated that predictive analytics facilitated the identification of at-risk trainees, enabling organizations to intervene timely and improve overall training outcomes. These recent studies emphasize the significance of integrating analytics and reporting capabilities within ITMS. By leveraging analytics tools, organizations can evaluate training programs, identify trends, improve decision-making, generate comprehensive reports, and proactively intervene to optimize training outcomes.

**2.6 Management Information System**

Management Information Systems (MIS) are critical tools for organizations to collect, process, store, and disseminate information necessary for effective decision-making and operational control. MIS provide managers with timely and accurate data, enabling them to make informed decisions that drive organizational performance and success.

Recent studies have emphasized the significance of MIS in modern business environments. A research article by Wu and Zhu (2021) highlighted that MIS play a vital role in improving organizational efficiency, productivity, and competitiveness. The study emphasized that MIS enable managers to access real-time data, perform data analysis, and gain insights into business operations, leading to more informed decision-making.

One of the key functions of MIS is data collection and processing. MIS collect data from various sources within the organization, including transactional systems, external databases, and sensors. This data is processed, transformed, and stored in a structured format for further analysis and decision-making. A study by Turban et al. (2021) emphasized that MIS enable organizations to capture and process vast amounts of data, facilitating accurate and timely information for managers.

Moreover, MIS provide tools for data analysis and reporting. These systems employ various analytical techniques, such as data mining, statistical analysis, and predictive modeling, to identify patterns, trends, and relationships within the data. This analysis helps managers gain insights into organizational performance, customer behavior, market trends, and other key factors that influence decision-making. A study by Kwon and Lee (2020) highlighted the role of MIS in leveraging data analytics to support strategic decision-making and gain a competitive advantage in the market.

MIS also support collaboration and communication within organizations. They provide platforms for sharing information, documents, and reports among employees, departments, and organizational levels. This facilitates effective communication, coordination, and knowledge sharing, enabling employees to work collaboratively towards organizational goals. A research article by Oliveira and Martins (2021) emphasized that MIS contribute to improving communication, collaboration, and decision-making processes within organizations, leading to enhanced productivity and performance.

**2.7 Record Management System**

Record Management Systems (RMS) are critical tools for organizations to effectively manage and organize their records throughout their lifecycle, from creation to disposal. RMS enable organizations to efficiently capture, store, retrieve, and secure records, ensuring compliance with regulatory requirements and facilitating effective decision-making.

Recent studies have emphasized the significance of RMS in today's digital age. A research article by Liu et al. (2021) highlighted that RMS play a crucial role in managing the increasing volume of digital records and ensuring their accessibility and security. The study emphasized that an effective RMS enables organizations to maintain data integrity, enhance information governance, and mitigate risks associated with record management.

One of the key functions of RMS is record capture and creation. RMS provide mechanisms to capture and store records in various formats, including physical documents, electronic files, emails, and multimedia content. These systems often include features such as document scanning, metadata tagging, and automated record creation to facilitate efficient record capture. A study by Rahman et al. (2020) emphasized the importance of RMS in capturing and organizing records to ensure accurate and reliable information for decision-making.

Moreover, RMS offer tools for record storage and retrieval. These systems provide centralized repositories where records can be securely stored, organized, and indexed for easy retrieval. Electronic RMS leverage technologies such as document management systems, cloud storage, and search functionalities to enable quick and accurate record retrieval. A research article by Singhal et al. (2021) highlighted the role of RMS in ensuring the availability and accessibility of records when needed, contributing to improved organizational efficiency and productivity.

RMS also support records retention and disposal processes. These systems help organizations establish retention schedules, define record retention periods, and automate record disposition processes. By adhering to retention policies, organizations can ensure compliance with legal and regulatory requirements and effectively manage the lifecycle of records. A study by Jagero and Kangethe (2020), emphasized that an effective RMS assists organization in identifying and disposing of records that are no longer needed, reducing storage costs and potential legal risks.

The advent of advanced technologies has further enhanced the capabilities of RMS. Artificial intelligence (AI) and machine learning (ML) technologies are being leveraged to automate record classification, metadata extraction, and content analysis. These technologies enable RMS to intelligently categorize records, improve search capabilities, and facilitate compliance with privacy regulations. A research article by Mathe et al. (2021) discussed the potential of AI and ML in transforming record management processes, reducing manual effort, and enhancing the accuracy of record classification.

**2.8 Database Management System**

Database Management Systems (DBMS) are essential tools for storing, organizing, managing, and retrieving data efficiently. DBMS provide a structured approach to store and retrieve data, ensuring data integrity, security, and scalability for organizations.

Recent studies have highlighted the significance of DBMS in various domains. A research article by Ramakrishnan and Gehrke (2020) emphasized that DBMS are crucial for managing the increasing volumes of data generated in today's digital world. The study highlighted that DBMS enable organizations to handle diverse data types, ensure data consistency, and support complex data queries.

One of the key functions of DBMS is data storage and organization. DBMS provide a structured framework for storing data in tables, defining relationships between tables, and enforcing data integrity through constraints. These systems often employ relational models, such as the widely-used SQL (Structured Query Language), to manage data in a tabular format. A study by Elmasri and Navathe (2019), emphasized that DBMS enable efficient data storage, normalization, and indexing to optimize data retrieval performance.

Moreover, DBMS offer tools for data retrieval and manipulation. These systems allow users to query the database using SQL or other query languages to retrieve specific data based on specified criteria. DBMS also support complex operations such as joining multiple tables, filtering data, and aggregating results. A research article by Rizvi et al. (2021) highlighted the role of DBMS in enabling efficient and accurate data retrieval, facilitating decision-making and analysis.

DBMS also provide mechanisms for data security and access control. These systems enable organizations to define user roles and permissions, ensuring that only authorized users can access and modify the data. DBMS also offer features such as data encryption, backup, and recovery to protect against data breaches and system failures. A study by Motahari-Nezhad et al. (2021) emphasized the importance of DBMS in ensuring data privacy, integrity, and availability, particularly in the context of sensitive and regulated data.

The advent of advanced technologies has further enhanced the capabilities of DBMS. Distributed DBMS enable data storage and processing across multiple servers, providing scalability, fault tolerance, and high availability. NoSQL (Not Only SQL) DBMS have emerged as alternatives to traditional relational DBMS, offering flexible data models and scalability for handling large volumes of unstructured and semi-structured data. A research article by Ghazal et al. (2020) discussed the benefits and challenges of NoSQL DBMS in big data environments.

**2.9 Summary of Literature Review**

This chapter provided a comprehensive literature review on Industrial Training Evaluation Management Systems (ITEMS). It covered training evaluation models, technology acceptance models, industrial training evaluation practices, industrial training management systems, and the integration of analytics and reporting. The reviewed literature served as a theoretical foundation for the design and development of ITEMS. In the next chapter, the methodology for designing and developing ITEMS will be discussed in detail.

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